Error Codes

6.1 Introduction

Refer to the troubleshooting tables in this section to help you diagnose and correct these types of errors.

- Those generated by the **Power-On Self-Test (POST)**

- Those generated by the **Extended Self-Test (EST)**

- Those displayed during ventilation and representing **soft errors**, **communications errors**, and **faults**

Within the tables, the lettered procedures corresponding to each error code are sequenced to correct the most probable malfunction or to present the most efficient corrective action first.

6.1.1 POST Error Codes

POST reports error information by lighting LED indicators on the CPU PCB. For some POST tests, an error code is also displayed by the 20-character display (message display window) and the 7202 Display, if installed. Separate error code tables are given for 80188-based units (Table 6-1) and 8088-based units (Table 6-2).

Within the error code tables, the LED representations of the error codes are shown, with a darkened circle indicating an LED is lit. Those POST tests that use the 20-character display show an error code and message like this:

xxyy

where:

xx   is the number of the test that failed

yy   is the number of the test step that failed

6.1.2 Soft Error Codes (Table 6-3)

A soft error code (or system error code) is displayed when a problem is detected during powerup or normal ventilator operation. If three soft errors are detected within 24 hours, the ventilator goes into back-up ventilation (BUV).

In the case of some soft errors, it may be extremely difficult to pinpoint the exact problem. For those codes, the table merely suggests a variety of possible hardware solutions. You may need to call Puritan Bennett Technical Support if your attempts to remedy one of these errors fail.

6.1.3 EST Error Codes (Table 6-4)

The 20-character display and 7202 Display (if installed) display error codes during EST testing, See Section 5 for a full description of EST.

6.1.4 Communications Error Codes (Table 6-5)

A communications error code is displayed whenever a problem is detected (during powerup or normal ventilator operation) that interferes with the ventilator's ability to communicate with an external device, such as the 7202 Display. Because this problem should not compromise the ventilator's ability to ventilate the patient, normal ventilator operation continues, although the error is stored in battery-backed RAM.

6.1.5 Fault Codes

A fault code is displayed when a problem detected during normal ventilator operation is serious enough to compromise ventilation. As a result, back-up ventilation (BUV) begins when the ventilator is powered off and on.

6.2 Interpreting Error Codes

When an error is detected during EST or during normal ventilator operation, the 20-character display shows an error code and message as follows:

ERR **xxxy** DO NOT USE

where:

xxx is the number of the test that failed

y indicates a specific error. In EST only, **y** may indicate a failure of a specific hardware subassembly, as follows:

1 Varies for each test. See error description for applicable test.

2 Not used.

3 Operator time out. See error description for applicable test.

4 Faulty PEEP/CPAP pressure transducer. Invalid P1 voltage was read.

5 Faulty absolute pressure transducer (P2). Invalid P2 voltage was read.

6 Faulty differential pressure transducer (DP). Invalid DP voltage was read.

7 Faulty oxygen flow sensor (Q1) or temperature sensor (T1). Invalid Q1 or T1 voltage was read.

8 Faulty air flow sensor (Q2) or temperature sensor (T2). Invalid Q2 or T2 voltage was read.

9 Faulty exhalation flow sensor (Q3) or temperature sensor (T3). Invalid Q3 or T3 voltage was read.

A Faulty oxygen proportional solenoid valve (PSOL1). Current value needed to establish
oxygen flow is out of range. See error description for applicable test.

B Faulty air proportional solenoid valve (PSOL2). Current value needed to establish air flow is out of range. See error description for applicable test.

Table 6-1: POST Error Codes (80188-Based Units)

Test	Error Code	Error Description	Corrective Action
POST initialization test 0 (attempts to invoke POST): Verifies whether POST initialized and is proceeding correctly.	Unit enters BUV ●●●●●●● ●	POST initialization failure	1. Check +5 V output. Adjust or replace power supply. 2. Replace DCI-display controller PCB and/or CPU PCB.
POST kernel test 1 (instruction set): Performs limited test of instruction set, including data transfer, arithmetic, bit manipulation, string manipulation, control transfer, and processor control. The test makes sure all microprocessor registers are working. This test does not check any instructions that use the stack.	●○○○○○○●	Microprocessor failed to properly execute instructions.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB.
POST kernel test 2 (connection of PCB tester): Verifies whether a PCB tester used at the factory is connected, and if so, whether it is connected properly.	●○○○○○●○	The bus timeout expected when CPU attempted to access tester memory location did not occur.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB.
POST kernel test 3 (flag RAM): Verifies integrity of flag area RAM by writing a pattern to it, then reading contents, and comparing it to original pattern.	●○○○○○●●	Mismatch between flag RAM (U705) pattern read and expected pattern.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB.
POST kernel test 4 (watchdog): Verifies that watchdog timer times out within acceptable interval.	●○○○○●○○	Watchdog timer failed to time out within 60 to 260 ms.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB.
POST kernel test 5 (stack RAM): Verifies integrity of stack RAM by writing a unique pattern to each byte, then reading contents, and comparing it to original pattern.	●○○○○●○●	Mismatch between stack RAM (U806) pattern read and expected pattern.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB.
POST kernel test 6 (extended instruction): Performs a test of the stack instructions.	●○○○○●●○	Microprocessor failed to properly execute instructions.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB.
POST kernel test 7 (bus timeout): Verifies bus timeout (timer 1) operation by writing to nonexistent memory location, then reading bus timeout flag to evaluate subsequent interrupt sequence. This test executed only if power fail flag indicates adequate ac. (When power is low, a bus timeout cannot generate a non-maskable interrupt.)	●○○○○●●●	Expected bus timeout did not occur.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB.

Table 6-1: POST Error Codes (80188-Based Units) (continued)

Test	Error Code	Error Description	Corrective Action
POST kernel test 8 (system clock): Verifies system clock (timer 2) operation by initializing timer and verifying that timer interrupt service routine has set timer test flag to proper value within 20 ±1 ms.	●000●000	Integral CPU timer 2 (system clock) did not time out within 20 ± 1 ms after being initialized.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB.
POST kernel test 9 (kernel checksum): Verifies kernel EPROM by performing checksum on EPROM contents.	●000●00●	Checksum mismatch between kernel EPROM and POST-supplied value.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB.
POST CPU PCB test 1 (POST reentry test): Checks POST reentry flag for value >2.	●●00000●	More than two attempts were made to restart POST.	1. Check ac power. 2. Check +5 V output. Adjust or replace power supply. 3. Replace CPU PCB.
POST CPU PCB test 2 (display initialization): Initializes front panel displays, so they can be used to relay messages.	●●0000●0	Unable to initialize displays.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB. 3. Replace DCI-display controller PCB.
POST CPU PCB test 3 (ac power check): Checks power fail flag.	●●0000●● LOW AC POWER	The ac voltage has declined to power fail module trip point. POST will continue to perform this check until power reaches threshold value.	1. Check ac power. 2. Check power supply voltages. Adjust or replace power supply.
POST CPU PCB test 4 (digital I/O initialization): Initializes digital I/O ports on CPU PCB, including clearing DAC values, setting all solenoids (except SOL6 and SOL8) off, and opening safety and exhalation valves.	●●000●00	Unable to initialize digital I/O ports.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB. 3. Replace conversion PCB.
POST CPU PCB test 5 (CPU PCB RAM): Verifies integrity of CPU PCB RAM by writing a unique pattern to each byte, then reading contents, and comparing it to original pattern.	●●000●0● 050x	Mismatch between RAM pattern read and expected pattern. Press <++> to determine which RAM device failed.	1. Replace CPU PCB.

Table 6-1: POST Error Codes (80188-Based Units) (continued)

Test	Error Code	Error Description	Corrective Action
POST CPU PCB test 8 (CPU PCB EPROM checksum): Verifies EPROM set on CPU PCB by performing checksum on EPROM contents.	●●oo●ooo 080x	EPROM checksum failure. Press <++> to determine which EPROM failed. Press <++> again for expected and actual checksum values.	1. Replace software EPROMs. 2. Replace CPU PCB.
POST offboard test 9 (Multibus RAM): Verifies integrity of Multibus RAM by writing a unique pattern to each byte, then reading contents, and comparing it to original pattern.	●●●o●oo● 0901	Mismatch between Multibus RAM pattern read and expected pattern. Press <++> for a descriptive error message.	1. Verify proper seating of and secureness of connections between DCI-display controller PCB and CPU PCB. 2. Replace DCI-display controller PCB. 3. Replace CPU PCB.
POST offboard test 10 (air flow EPROM): Verifies air flow sensor (Q2) EPROM by performing checksum on its contents.	●●●o●o●o 1001	EPROM checksum failure. Press <++> for a descriptive error message.	1. Verify that air flow sensor EPROM (U504) and oxygen flow sensor EPROM (U406) are not reversed. 2. Replace Q2/T2 and air flow sensor EPROM (U504). 3. Replace DCI-display controller PCB. 4. Replace CPU PCB.
POST offboard test 11 (oxygen flow EPROM): Verifies oxygen flow sensor (Q1) EPROM by performing checksum on its contents.	●●●o●o●● 1101	EPROM checksum failure. Press <++> for a descriptive error message.	1. Verify that air flow sensor EPROM (U504) and oxygen flow sensor EPROM (U406) are not reversed. 2. Replace Q1/T1 and oxygen flow sensor EPROM (U406). 3. Replace DCI-display controller PCB. 4. Replace CPU PCB.
POST offboard test 12 (A/D reference voltages): Checks for ground and +10 V reference for analog-to-digital converter. Verifies ground tolerance of +49 mV. Verifies +10 V tolerance of -54 mV.	●●●o●●oo 120x	Reference or ground channel out of tolerance. Press <++> to determine whether ground or +10 V reference out of range. Press <++> again to see measured and expected values.	1. Check ±15 V output. Adjust or replace power supply. 2. Replace conversion PCB. 3. Replace interface PCB. 4. Install surge suppressor if missing. 5. Replace front panel display PCB. 6. Replace interconnect cable between CPU PCB and conversion PCB.

Table 6-1: POST Error Codes (80188-Based Units) (continued)

Test	Error Code	Error Description	Corrective Action
POST offboard test 13 (A/D and D/A converters): Loops output of digital-to-analog converter DAC3 through multiplexer (channel 3) to input of analog-to-digital converter. Checks analog output for a tolerance of ± (0.6% of digital input + 20 counts).	●●●○●●○● 13xx	Voltage comparison between DAC output and A/D input out of range. Press <++> to determine which pattern failed. Press <++> again to see measured and expected values	1. Check ±15 V output. Adjust or replace power supply. 2. Replace conversion PCB. 3. Replace interface PCB. 4. Replace CPU PCB.
POST offboard test 14 (battery-backed RAM checksum): Verifies battery-backed RAM by performing checksum on contents. **NOTE:** This code will appear if you have disconnected the battery for any reason.	●●●○●●●○ 1401	Battery-backed RAM checksum failure.	1. Check secureness of battery connections. 2. Check continuity of CR2 on motherboard. Replace motherboard. 3. Replace fuse in utility panel harness. 4. Replaces batteries. 5. Replace CPU PCB.
POST offboard test 15 (three watchdog timeouts in 24 hour): Checks EST and power fail flags to monitor watchdog timeout activities.	●●●○●●●● 1501	Three unexpected program interruptions occurred within past 24 hours.	1. Check for any soft error codes (3000-4000 series) in memory. Refer to that error code description. 2. Replace power supply module(s) or entire power supply. 3. Replace DCI-display controller PCB. 4. Replace CPU PCB.

> **Warning**
>
> Error 1501 is indicative of an intermittent fault that may or may not be repeatedly detected by Total EST. The error can be cleared and normal operation restored by running Total EST. It is important that the operator make note of this condition and call a Puritan Bennett representative.

Test	Error Code	Error Description	Corrective Action
POST offboard test 16 (BUV): Checks back-up ventilator with respect to power fail signal.	●●●●●○○○○ 1601	BUV is on and a power fail has not occurred. Press <++> for a descriptive error message.	1. Replace interface PCB. 2. Replace CPU PCB. 3. Replace conversion PCB. 4. Replace DCI-display controller PCB.
POST offboard test 20 (system tester connection): Verifies whether a system tester used in the factory is connected to the ventilator, and if so, whether it is connected properly	●●●●●○●○○ 2001	Possible system tester communication link failure.	1. If a system tester is connected, check connection between CPU PCB connector J100 and tester connector J100. Ensure that the tester is operational before powering up the ventilator. Replace the local bus extension cable (P/N 4-019694-00) if necessary. 2. If a tester is not connected, replace CPU PCB.

Table 6-2: POST Error Codes (8088-Based Units)

Test	Error Code	Error Description	Corrective Action
POST kernel test 0: Verifies proper functioning of CPU registers and flags, kernel checksum, and proper bus timeout operation.	○○○	Improper functioning of CPU registers or flags, kernel checksum failure, or bus timeout failure	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB.
POST kernel test 1: Verifies proper operation of CPU PCB RAM by writing a pattern to RAM, reading pattern from RAM, and comparing it to original pattern.	○○●	Mismatch between pattern read and expected.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB.
POST kernel test 2: Verifies proper operation of Intel 8253 Programmable Interval Timer (PIT) and Intel 8259 Programmable Interrupt Controller (PIC). The PIT is tested by comparing its performance against software-implemented timing loop.	○●○	Failure of PIT or PIC.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB.
POST kernel test 3: Selectively sets and reads I/O ports of Intel 8755 EPROM-I/O to perform limited operational check.	○●●	EPROM-I/O read operation unsuccessful.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB.
POST kernel test 4: Checks all EPROMs on CPU PCB for proper contents and positioning.	●○○	CPU PCB EPROM checksum failure.	1. Check +5 V output. Adjust or replace power supply. 2. Reseat or replace CPU PCB EPROMs or CPU PCB.
POST kernel test 5: Verifies proper operation of RAM by writing a pattern to RAM, reading pattern from RAM, and comparing it to original pattern.	●○●	Mismatch between pattern read and what was expected.	1. Check +5 V output. Adjust or replace power supply. 2. Replace CPU PCB.
POST test 060 (digital I/O): Selectively sets and reads Intel 8255 Parallel Peripheral Interface I/O ports to perform limited operational check.	●●○ 0601	Pattern read was invalid. I/O access was unsuccessful.	1. Replace CPU PCB.
POST test 070 (Multibus access): Verifies Multibus performance by reading and writing a pattern to RAM locations on memory and display controller PCBs. Program EPROM access is verified by reading a fixed location within EPROM memory space.	●●○ 0701	Pattern read operation was invalid. Memory access was unsuccessful.	1. Replace memory PCB. 2. Replace display controller PCB. 3. Replace CPU PCB.
POST test 080 (memory PCB EPROM checksum): Verifies EPROM set on memory PCB by performing checksum on EPROM contents.	●●○ 0801	EPROM checksum failure.	1. Check connection of/or replace EPROMs on memory PCB and the six EPROMs on CPU PCB. 2. Replace memory PCB.

Table 6-2: POST Error Codes (8088-Based Units) (continued)

Test	Error Code	Error Description	Corrective Action
POST test 090 (memory PCB RAM): Verifies Multibus RAM using pattern-type test.	●●○ 0901	Pattern test failure.	1. Verify that there is a RAM chip in position U807 of memory PCB (If your unit's software has been upgraded from an "N" level to a "P" level or higher). 2. Replace memory PCB.
POST test 100 (air flow sensor EPROM): Verifies air sensor EPROM by performing checksum on EPROM contents.	●●○ 1001	Checksum invalid.	1. Replace Q2/T2 and air flow sensor EPROM, U403. 2. Replace memory PCB.
POST test 110 (oxygen flow sensor EPROM): Verifies Q1 EPROM by performing checksum on EPROM contents.	●●○ 1101	Checksum invalid.	1. Replace QI/T1 and oxygen flow sensor EPROM, U302. 2. Replace memory PCB.
POST test 120 (A/D reference voltages): Verifies ground and reference channels of A/D converter on conversion PCB. Tests for ground tolerance of ±14 LSB (±34 mV) and reference tolerance of 14 LSB (±34 mV).	●●○ 1201	Reference or ground channel out of range.	1. Check ±15 V output. Adjust or replace power supply. 2. Replace conversion and/or interface PCB. 3. Install surge suppressor if not present. 4. Check connection of interconnect cable between CPU PCB and conversion PCB. Replace cable if required.
POST test 130: Tests A/D and D/A converters' breakpoint values throughout their voltage range. Channels DAC output to the A/D converter and ramps through its voltage range. The analog meter or bar graph display will respond during this test.	●●○ 1301	Voltage comparison between DAC output and A/D input out of range.	1. Check +5 V output. Adjust or replace power supply. 2. Replace conversion PCB 3. Replace interface PCB. 4. Replace CPU PCB.
POST test 140: Verifies performance and contents of battery-backed RAM. Performs checksum of battery-backed RAM contents and determines battery condition. **NOTE:** This code will appear if you have disconnected the batteries for any reason.	●●○ 1401	Battery-backed RAM pattern test failed.	1. Check secureness of battery connections. 2. Check continuity of CR2 on motherboard. Replace motherboard. 3. Replace fuse in utility panel harness. 4. Replaces batteries. 5. Replace memory PCB.

Table 6-2: POST Error Codes (8088-Based Units) (continued)

Test	Error Code	Error Description	Corrective Action
POST test 150: Determines whether ventilator has had three unexpected system interruptions within past 24 hours.	●●○ 1501	Three unexpected program interruptions occurred within past 24 hours.	1. Check for any soft error codes (3000-4000 series) in memory. Refer to that error code description. 2. Replace power supply module(s) or entire power supply. 3. Replace display controller PCB. 4. Replace CPU PCB.

Warning

Error 1501 is indicative of an intermittent fault that may or may not be repeatedly detected by Total EST. The error can be cleared and normal operation restored by running Total EST. It is important that the operator make note of this condition and call a Puritan Bennett representative.

Test	Error Code	Error Description	Corrective Action
POST test 160: Verifies that BUV system has been properly initialized during POST.	●●○ 1601	BUV initialization failure.	1. Replace interface PCB. 2. Replace CPU PCB. 3. Replace conversion PCB.
Display controller and/or front panel display PCB test	●●○ No message	Indeterminate.	1. Verify security of display cable connections. 2. Replace display controller PCB. 3. Replace front panel display PCB.
POST initialization: Attempts to invoke POST.	●●● Unit will go into BUV	POST initialization failure.	1. Verify proper operation of +5 V power supply. 2. Replace display controller PCB and/or CPU PCB.
POST passed	●●●	POST passed.	Ventilator operation will continue automatically.
Test 02x: Prepares ventilator to run EST.	02xx	System error; problem occurred between time <EST> button was pressed and POST began.	1. Replace CPU PCB or memory PCB.
Test 30x: Executes Schedule-Total EST-Task.	30xx	System error; task aborted.	1. Run Total EST. 2. See error 1501.
Test 31x: Executes Declare-Apnea-Task.	31xx	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace CPU PCB or memory PCB. 4. Replace pressure transducer PCB.

Table 6-3: Soft Error (All Units)

Test	Error Code	Error Description	Corrective Action
Test 32x: Delivers breath.	32xx	System error; task aborted.	1. Run Total EST. 2. See error 1501.
	3226	System error; task aborted.	1. Check ±15 V output. Adjust or replace power supply. 2. Replace conversion and/or interface PCB. 3. Install surge suppressor if not present. 4. Check connection of interconnect cable between CPU PCB and conversion PCB. Replace cable if required.
	3227	System error; task aborted.	1. See error 3226.
Test 33x: Strobes watchdog timer.	3301	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace CPU PCB or memory PCB.
Test 34x: Autozeroes pressure sensors.	34xx	System error; task aborted.	1. Run Total EST. 2. Faulty P1. Replace pressure transducer PCB. 3. Replace CPU PCB, memory PCB, pressure transducer PCB, SOL6 and SOL8, or interface PCB.
Test 35x: Controls breath delivery.	35xx	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace CPU PCB or memory PCB. 4. Check motherboard Multibus strip.
Test 36x: Controls pulse oximetry.	36xx	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace pulse oximetry PCB.
Test 37x: Checks system pressures.	37xx	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace CPU PCB, memory PCB, SOL3, or pressure transducer PCB.
Test 38x: Calculates pressures.	38xx	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace pressure transducer PCB, SOL4, SOL6, SOL8, or interface PCB.
	3812	System error; task aborted.	1. Make sure pneumatic harness is securely connected to motherboard. 2. Replace pressure transducer PCB. 3. Replace SOL6 and/or SOL8. 4. Replace interface PCB.
	3834	System error; task aborted.	1. See error 3812.

Table 6-3: Soft Error (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 39x: Keyboard interrupt service routine.	39xx	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace CPU PCB, memory PCB, DCI-display controller or display controller PCB, keyboard, or front panel display PCB.
	39BE	Option select device failed. System defaults to operation with all options inactive.	1. Install new option select device. 2. Replace memory PCB or DCI-display controller PCB.
Test 40x: Controls apnea timing and declaration.	40xx	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace CPU PCB or memory PCB.
Test 41x: Checks task execution.	41xx	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace CPU PCB or memory PCB.
Test 42x: Performs spirometry.	42xx	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace Q3/T3, interface PCB, conversion PCB, CPU PCB, or memory PCB.
	4201	System error; task aborted.	1. Run Total EST. 2. See error 1501.
	4205	Excess tidal volume detected. Tidal volume greater than 8 liters for one breath phase.	1. Verify that externally sourced nebulizer is not being used. 2. Verify that no external flow source is being used. 3. Replace Q3/T3, interface PCB, and/or Q3/T3 harness.
Test 43x: Activates alarm LEDs, status lights, and nurse call signal.	43xx	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace front panel display PCB, display controller PCB, DCI-display controller PCB, interface PCB, CPU PCB, and/or memory PCB.
Test 44x: Controls analog meter.	44xx	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace SOL1, SOL2, CPU PCB, and/or memory PCB.
Test 45x: Monitors timed functions.	45xx	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace SOL1, SOL2, CPU, or memory PCB.
Test 46x: Gathers and averages DCI trending information.	46xx	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace CPU PCB, memory PCB, or DCI-display controller PCB.

Table 6-3: Soft Error (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 47x: Monitors options 30 and 40.	47xx	System error; task aborted.	1. Run Total EST. 2. See error 1501. 3. Replace CPU PCB or memory PCB.
Test 480: Opens and closes safety valve.	4801	System error; task aborted.	1. Run Total EST. 2. See error 1501.
Test 48F: Executes interrupt service routines.	48F8	Illegal front panel interrupt.	1. Run Total EST. 2. Replace front panel display PCB. 3. Replace DCI-display controller or display controller PCB.
	48F9	Unexpected bus timeout.	1. Run Total EST. 2. Verify power supply voltages. 3. Verify all ac and dc connections. 4. Verify that all PCBs are properly seated. 5. Replace CPU PCB. 6. Replace Q1/T1 and/or Q2/T2.
	48FA	Overflow interrupt.	1. Run Total EST. 2. Replace CPU PCB. 3. Replace memory PCB.
	48FB	Breakpoint interrupt.	1. See error 48FA.
	48FC	Single-step interrupt.	1. See error 48FA.
	48FD	Divide-by-zero interrupt.	1. See error 48FA.
	48FF	Unexpected interrupt.	1. See error 48FA.

Table 6-4: EST Errors (All Units)

Test	Error Code	Error Description	Corrective Action
Test 511: Checks battery-backed RAM using a variable pattern-type test. The contents of battery-backed RAM are restored at end of test.	5111	Battery-backed RAM pattern test failed.	1. **8088:** Replace memory PCB. **80188:** Replace CPU PCB.
Test 512: Verifies integrity of battery-backed RAM contents by performing checksum.	5121	Checksum mismatch.	1. **80188:** Replace CPU PCB. **8088:** Replace memory PCB. 2. Replace motherboard. 3. Visually check traces and connections on motherboard.
Test 521: Autozeroes P1 by venting transducer to atmosphere by energizing SOL8.	5211	P1 failed to attain zero level.	1. Check pressure transducer PCB connector J4. 2. Check connection of SOL8. 3. Replace SOL8. 4. Replace pressure transducer PCB. 5. Replace interface PCB.
	5213	Operator response to block wye timed out. Operator did not respond to prompt within 30 seconds.	1. Continue Total EST as described in Section 5.
Test 522: Vents P2 to atmospheric pressure. Autozeroes P2, de-energizes SOL5.	5221	P2 failed to attain zero level.	1. Check pressure transducer PCB connector J4. 2. Check SOL5 connection. 3. Replace SOL5. 4. Replace pressure transducer PCB. 5. Replace interface PCB.
Test 523: Autozeroes DP. Energizes SOL6.	5231	DP failed to attain zero level.	1. Check pressure transducer PCB connector J4. 2. Check SOL6 connection. 3. Replace SOL6. 4. Replace pressure transducer PCB. 5. Replace interface PCB.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 524: Verifies that oxygen supply is connected to ventilator. Prompts operator to connect oxygen.	5241	Oxygen supply not connected to the ventilator.	1. Check that oxygen supply is connected to ventilator and supply pressure is at least 35 psig (241.33 kPa). 2. Make sure pneumatic harness is securely connected to motherboard. 3. Check connections to PS1. 4. Replace interface PCB. 5. Replace conversion PCB interconnection cable (P/N 4-019231-00) connected to J4 on interface PCB. 6. Replace pneumatic harness (P/N 4-019238-00). 7. Replace PS1 (P/N 4-019068-00).
	5243	Operator response timed out. Operator did not respond to prompt within 30 seconds.	1. Continue Total EST as described in Section 5.
Test 525: Verifies connection of air supply	5251	Air supply not connected to ventilator.	1. Check that air supply is connected to ventilator and supply pressure is at least 35 psig (241.33 kPa). 2. Check pneumatic harness connection J10 on motherboard. 3. Check connections to PS2 and PS3. 4. Replace interface PCB. 5. Replace conversion PCB interconnection cable (P/N 4-019231-00) connected to J4 on interface PCB. 6. Replace pneumatic harness (P/N 4-019238-00). 7. Replace PS2 and PS3.
	5253	Operator response timed out. Operator did not respond to prompt within 30 seconds.	1. Continue Total EST as described in Section 5.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 531: Verifies that an operator-requested PEEP pressure of zero was established. This test assumes that test 521 has passed and P1 can be autozeroed.	5311	PEEP pressure of zero was not established. This test assumes the PEEP autozero test was passed.	1. Operator did not turn PEEP/CPAP control to zero within 15 seconds. Refer to Section 5 to continue Total EST. 2. Block patient wye. 3. Replace REG5. 4. Replace pressure transducer PCB. 5. Replace SOL8. 6. Replace interface PCB.
	5313	Operator time elapsed before zero PEEP was established	1. Operator did not respond to [SET PEEP = 0] prompt within 15 seconds. Refer to Section 5 to continue Total EST. 2. Replace/adjust REG5 and jet venturi. 3. See test 521.
	5314	Invalid P1 reading. PEEP pressure action assumes that test 521 has been successfully run.	1. Replace pressure transducer PCB. 2. Replace interface PCB. 3. Verify actuation of SOL8. 4. Replace SOL8.
Test 532: Before Total EST continues with active portions of testing, patient connection is evaluated. The air flow subsystem is set to establish 10 lpm flow, and measured air flow (Q2) is compared to Q3 exhaled flow. The patient must be disconnected, the wye properly plugged, and Q3 properly connected.	5321	Flow reading discrepancy between Q2 and Q3. Air flow controller unable to establish desired flow rate after 30 seconds.	1. If value in peak flow setting window is constant (not fluctuating), take these corrective actions: a. Check to see if patient system is properly connected and Q3/T3 properly inserted. Check for obstructions. b. Check air supply for given flow rate. c. Check for leaks in Q2/T2 couplings. d. Adjust REG2 to between 10 and 11 psi (68.95 to 75.85 kPa) or replace. e. Replace Q3/T3. f. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). g. Replace Q3/T3 harness. h. Replace CV6 and CV7. i. Replace interface PCB. j. Replace proportional valve group. 2. If value in peak flow setting window is fluctuating it may mean that delivered air flow (10 lpm) is unstable. To isolate cause of instability, first try rerunning test using an alternate gas source (e.g., compressor instead of wall air). 3. If the test fails when operating from using *either* wall air or the compressor, take these corrective actions: a. Check for leaks in Q2/T2 couplings. b. Replace Q2/T2 and air flow sensor. c. Replace proportional valve group.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action

			4. If test fails *only when operating from wall air*, take these corrective actions:
			  a. Connect unit to a different wall outlet, tank regulator, or gas source (source gas may be unstable at 10 lpm).
			  b. Replace REG2.
			  c. Replace CV4.
			  d. Replace SOL3.

Test 532: (continued)	5321		5. If test fails *only when operating from compressor*, take these corrective actions:
			  a. Check for leak at air inlet while ventilator is operating from compressor. If a leak is detected, replace REG2 assembly.
			  b. Replace F6.
			  c. Replace compressor shock mounts.
			  d. Replace compressor (perform 10,000-hour preventive maintenance).

	5328	Temperature-compensated air flow reading invalid.	1. Check Q2/T2 connection (J6) on interface PCB. 2. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 3. Replace interface PCB. 4. Allow unit to warm up if it has been sitting in cold storage.
	5329	Exhalation flow reading from Q3 invalid.	1. Check Q3/T3 electrical and tubing connections within exhalation compartment. 2. Check Q3/T3 connection (J1) on interface PCB. 3. Replace Q3/T3. 4. Replace Q3 harness. 5. Replace Interface PCB.
	532B	PSOL2 drive current out of range.	1. Check for leaks in Q2/T2 couplings. 2. Adjust or replace REG2. 3. Replace proportional valve group. 4. ReplaceQ2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 5. Replace interface PCB.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 533: Verifies patient tubing compliance to check that patient is not connected. The anticipated compliance of the tubing system is 0.3 to 5.6 mL/cmH$_2$O; if a patient is attached, it is anticipated that a change in the tubing volume will occur during patient breathing. This change will be reflected as a failure of the compliance test. Patient tubing system is pressurized to 30 cmH$_2$O during this test.	5331	Excessive patient tubing compliance detected. SOL4 energized and DP sampled until DP reading is 30 cmH$_2$O.	1. Check that patient is disconnected from ventilator. 2. Check that patient system is properly installed and that wye is blocked. 3. Check for exhalation valve leaks. 4. Replace exhalation pilot network (P/N 4-018290-00). 5. Check that bacteria filters are not clogged. 6. Check for an obstruction or disconnect in patient circuit. 7. Replace pressure transducer PCB.
	5336	DP reading invalid. DP pressure action assumes that test 521 was passed.	1. Check for leaks in patient system. 2. Check pressure transducer PCB connector J4. 3. Replace pressure transducer PCB. 4. Replace interface PCB.
Test 534: Leaving patient tubing system pressurized from test 533, takes stable reading of DP to check lack of patient connection.	5341	Stable reading of DP not obtained. Pressure fluctuations were detected at patient wye.	1. Check that patient is disconnected from ventilator. 2. Check that wye is properly blocked, exhalation valve is active, and patient system does not leak. 3. Patient wye was moved during testing. Continue Total EST as described in Section 5. 4. Check for leaks out vent port on safety/check valve CV3. 5. Replace internal exhalation valve. 6. Replace CV7. 7. Replace conversion PCB.
	5346	DP reading invalid. DP pressure action assumes that test 521 was passed.	1. Check for leaks in patient system. 2. Check pressure transducer PCB connector J4. 3. Replace pressure transducer PCB. 4. Replace interface PCB.
Test 535: Compares values of DP and P2 while patient tubing system remains pressurized. This test assumes transducers were autozeroed successfully during tests 522 and 523.	5351	Cross checks of P2 and DP out of range.	1. Check patient is disconnected and patient system is properly installed. 2. Check pneumatic connection between P2 and CV3. 3. Replace pressure transducer PCB. 4. Replace SV/CV3. 5. Replace SOL6.
	5355	P2 reading invalid. P2 pressure action assumes that test 521 was passed.	1. Check pressure transducer PCB connector J4. 2. Replace pressure transducer PCB. 3. Replace interface PCB.
	5356	DP reading invalid. DP pressure action assumes that test 521 was passed.	1. Check pressure transducer PCB connector J4. 2. Replace pressure transducer PCB. 3. Replace interface PCB. 4. Replace SOL6.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 541: System leak test. Pressurizes patient system to 90 cmH$_2$O using air flow rate of 10 lpm and checks for leaks. This test assumes that patient detection tests 533, 534, and 535 passed; that patient wye is blocked; and that patient tubing system is properly installed.	5411	Patient system failed to achieve desired pressure.	1. Check patient tubing for leaks, check exhalation valve operation and humidifier connection, check patient bacteria filter, and check patient wye for blockage. 2. Check that patient system is connected and patient pressure water trap is not leaking. 3. Replace exhalation valve. 4. Check SOL6 actuation. 5. Check SOL4 actuation.
	5416	DP reading invalid. DP pressure action assumes that test 521 was passed.	1. Check pressure transducer PCB connector J4. 2. Replace pressure transducer PCB. 3. Replace interface PCB.
	5418	Air flow reading from Q2 invalid.	1. Check Q2/T2 connection (J6) on interface PCB. 2. Check Q2/T2 fittings. 3. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 4. Replace interface PCB.
	541B	PSOL2 drive current out of range.	1. Check for leaks in Q2/T2 couplings. 2. Adjust or replace REG2. 3. Check air source pressure. 4. Check high-pressure hose diameter.
Test 542: Monitors 90 cmH$_2$O pressure obtained in test 541 for leaks and verifies that patient tubing system does not lose more than 15 cmH$_2$O over 10 seconds.	5421	Patient system failed to maintain constant pressure. The system pressure at which leak was detected is displayed beside error code. A 5421 error that occurs during Quick EST does not cause Total EST to fail.	1. Check that the patient system is properly connected and free of leaks. 2. Check exhalation valve operation and connection. 3. Check the operation of SOL6. 4. Check outlet connector (P/N 4-019353-00) and attached flex tube. 5. Check the operation of SOL4. 6. Check for leaks in CV7. 7. Check the operation of SV/CV3. **NOTE:** **If ventilator continues to pressurize after achieving 90 cmH$_2$O, replace proportional valve group.**
	5426	Reading from differential pressure transducer DP invalid.	1. Check connection of patient system at patient wye and water trap. 2. Check pressure transducer PCB connector J4. 3. Replace pressure transducer PCB. 4. Replace SOL6.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 543: Cross-checks DP and P2 for accuracy while patient system remains pressurized. This test assumes pressure transducers were autozeroed successfully during test 535.	5431	Cross check of DP and P2 out of range.	1. Check pneumatic connection between P2 and CV3. 2. Replace pressure transducer PCB. 3. Replace SV/CV3. 4. Check that R5 is not blocked.
	5435	P2 reading invalid. P2 pressure action assumes that test 521 was passed.	1. Check pressure transducer PCB connector J4. 2. Replace pressure transducer PCB. 3. Replace interface PCB. 4. Check that R5 is not blocked.
	5436	DP reading invalid. DP pressure action assumes that test 521 was passed.	1. Check pressure transducer PCB connector J4. 2. Replace pressure transducer PCB. 3. Replace interface PCB.
Test 551: Compares Q2 reading with Q3 reading at steady-state flow of 0 lpm.	5511	Flow rate comparison out of range (+0.6 lpm) or air flow controller unable to establish desired flow rate after 15 seconds.	1. Check air supply for given flow rate. 2. Check for leaks in Q2/T2 couplings. 3. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 4. PSOL2 leaks at zero flow. Replace proportional valve group. 5. Replace interface PCB. 6. Check for leaking CV6 at 0 lpm.
	5518	Air flow reading from Q2 invalid.	1. Check Q2/T2 connection (J6) on interface PCB. 2. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 3. PSOL2 leaks at zero flow. Replace proportional valve group. 4. Replace interface PCB.
	5519	Air flow reading from Q3 invalid.	1. Check Q3/T3 electrical and tubing connections within exhalation compartment. 2. Replace Q3/T3. 3. Check Q3/T3 connection (J1) on interface PCB. 4. Replace interface PCB.
	551B	PSOL2 drive current out of range.	1. Check for leaks in Q2/T2 couplings. 2. Adjust or replace REG2. 3. Replace proportional valve group. 4. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 5. Replace interface PCB.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 552: Compares Q2 reading with Q3 reading at steady-state flow of 20 lpm.	5521	Flow rate comparison out of range.	1. Check Q3/T3 electrical and tubing connections. 2. Check air supply for given flow rate. 3. Check for leaks in Q2/T2 couplings. 4. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 5. Adjust or replace REG2. 6. Replace proportional valve group. 7. Replace interface PCB. 8. Continue EST for comparison of Q3/T3 and Q1/T1.
	5528	Air flow reading from Q2 invalid.	1. Check Q2/T2 connection (J6) on interface PCB. 2. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 3. Replace interface PCB.
	5529	Air flow reading from Q3 invalid.	1. Check Q3/T3 electrical and tubing connections with exhalation compartment. 2. Check Q3/T3 connection (J1) on interface PCB. 3. Replace Q3/T3. 4. Replace interface PCB.
	552B	PSOL2 drive current out of range.	1. Verify air source pressure. 2. Check high-pressure hose diameter. 3. Adjust or replace REG2. 4. Check for leaks in Q2/T2 couplings. 5. Replace proportional valve group. 6. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 7. Replace interface PCB. 8. Check for restriction in air inlet filter, air hose, or source gas supply.
Test 553: Compares Q2 reading with Q3 reading at steady-state flow of 50 lpm.	5531	Flow rate comparison out of range.	1. See error 5521.
	5538	Air flow reading from Q2 invalid.	1. See error 5528.
	5539	Air flow reading from Q3 invalid.	1. See error 5529.
	553B	PSOL2 drive current out of range.	1. See error 552B.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 554: Compares Q2 reading with Q3 reading at steady-state flow of 100 lpm.	5541	Flow rate comparison out of range.	1. See error 5521.
	5548	Air flow reading from Q2 invalid.	1. See error 5528.
	5549	Air flow reading from Q3 invalid.	1. See error 5529.
	554B	PSOL2 drive current out of range.	1. See error 552B.
Test 555: Compares Q2 reading with Q3 reading at steady-state flow of 120 lpm.	5551	Flow rate comparison out of range.	1. See error 5521.
	5558	Air flow reading from Q2 invalid.	1. See error 5528.
	5559	Air flow reading from Q3 invalid.	1. See error 5529.
	555B	PSOL2 drive current out of range.	1. See error 552B.
Test 556: Compares Q2 reading with Q3 reading at steady-state flow of 180 lpm (wall air) or 120 lpm (compressor). If wall air flow rate of 180 lpm cannot be established, a Q2/Q3 comparison is made at whatever flow rate the wall supply can deliver.	5561	Flow rate comparison out of range.	1. See error 5521.
	5568	Air flow reading from Q2 invalid.	1. See error 5528.
	5569	Air flow reading from Q3 invalid.	1. See error 5529.
	556B	PSOL2 drive current out of range.	1. See error 552B.
Test 557: Autozeroes PSOL1 and PSOL2 with flow rate of 1 lpm and stores current required to establish flow in battery-backed RAM. If current used is outside of range 25-380 mA, the test does not fail, but a default current value of 130 mA is used in the calculations.	5571	Unable to autozero PSOL1 and PSOL2 with flow rate of 1 lpm.	1. Check Q1/T1 and Q2/T2 connections (J5 and J6) on interface PCB. 2. If current value displayed in PEAK FLOW window is outside of range 25-380 mA, replace Q1/T2 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). If value in TIDAL VOL window is outside of same range, replace Q2/T1 and air flow sensor U504 (80188) or U403 (8088). 3. Check proper adjustment of REG1 (if Q1/T1 value is outside of range) or REG2 (if Q2/T2 value is out of range). 4. Replace proportional valve group. 5. Replace REG1 or REG2, as appropriate. 6. Replace interface PCB. 7. Replace compressor.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 557 (continued)	5577	Oxygen flow reading from Q1 invalid.	1. Check Q1/T1 connection (J5) on interface PCB. 2. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 3. Replace interface PCB.
	5578	Air flow reading from Q2 invalid.	1. Check Q2/T2 connection (J6) on interface PCB. 2. Check connection of air flow sensor EPROM, U504 (80188) or U403 (8088). 3. Replace interface PCB.
	557A	PSOL1 drive current out of range.	1. Check for leaks in Q1/T1 couplings. 2. Adjust or replace REG1. 3. Replace proportional valve group. 4. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 5. Replace interface PCB.
	557B	PSOL2 drive current out of range.	1. Check for leaks in Q2/T2 couplings. 2. Adjust or replace REG2. 3. Replace proportional valve group. 4. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 5. Replace interface PCB.
Test 558: Flow-by offsets calibration. Compares Q2 reading with Q3 reading at steady-state flow of 10 lpm. Stores air and exhaled flows in battery-backed RAM.	5581	Flow rate comparison out of range or air controller unable to establish flow within 15 seconds.	1. Check Q3/T3 electrical and tubing connections. 2. Replace Q3/T3. 3. Replace Q2/T2. 4. Adjust or replace REG2. 5. Replace interface PCB
	5588	Q2 reading out of range.	1. Check Q2/T2 electrical and tubing connections. 2. Replace Q2/T2. 3. Adjust or replace REG2. 4. Replace interface PCB.
	5589	Q3 reading out of range.	1. Check Q3/T3 electrical and tubing connections. 2. Replace Q3/T3. 3. Replace interface PCB.
	558B	PSOL2 drive current out of range.	1. Check for leaks in Q2/T2 couplings. 2. Adjust or replace REG2. 3. Replace proportional valve group. 4. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 5. Replace interface PCB.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 559: Flow-by offsets calibration. Compares Q2 reading with Q3 reading at flow of 20 lpm. Stores air and exhaled flows in battery-backed RAM.	5591	Flow rate comparison out of range or air controller unable to establish flow within 15 seconds	1. See error 5581.
	5598	Q2 reading out of range.	1. See error 5588.
	5599	Q3 reading out of range.	1. See error 5589.
	559B	PSOL2 drive current out of range.	1. See error 558B.
Test 561: Compares Q1 reading with Q3 reading at steady-state flow of 0 lpm.	5611	Flow rate comparison out of range. Oxygen flow controller unable to establish desired flow rate after 15 seconds.	1. Check oxygen supply for given flow rate. 2. Check for leaks in Q1/T1 couplings. 3. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 4. PSOL1 leaks at zero flow. Replace proportional valve group. 5. Replace interface PCB. 6. Check for leaks in CV6.
	5617	Oxygen flow reading from Q1 invalid.	1. Check Q1/T1 connection (J6) on interface PCB. 2. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 3. Replace interface PCB.
	5619	Oxygen flow reading from Q3 invalid.	1. Check Q3/T3 electrical and tubing connections. 2. Check Q3/T3 connection (J1) on interface PCB. 3. Replace Q3/T3. 4. Replace interface PCB.
	561A	PSOL1 drive current out of range.	1. Check for leaks in Q1/T1 couplings. 2. Adjust or replace REG1. 3. Replace proportional valve group. 4. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 5. Replace interface PCB. 6. Check oxygen source pressure. 7. Check high-pressure hose diameter. 8. Check for a restriction in the oxygen inlet filter, oxygen hose, or oxygen supply.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 562: Compares Q1 reading with Q3 reading at steady-state flow of 20 lpm.	5621	Flow rate comparison out of range. Oxygen flow controller unable to establish desired flow rate after 15 seconds.	1. See error 5611.
	5627	Oxygen flow reading from Q1 invalid.	1. See error 5617.
	5629	Oxygen flow reading from Q3 invalid.	1. See error 5619.
	562A	PSOL1 drive current out of range.	1. See error 561A.
Test 563: Compares Q1 reading with Q3 reading at steady-state flow of 50 lpm.	5631	Flow rate comparison out of range.	1. See error 5611.
	5637	Oxygen flow reading from Q1 invalid.	1. See error 5617.
	5639	Oxygen flow reading from Q3 invalid.	1. See error 5619.
	563A	PSOL1 drive current out of range.	1. See error 561A.
Test 564: Compares Q1 reading with Q3 reading at steady-state flow of 100 lpm.	5641	Flow rate comparison out of range.	1. See error 5611.
	5647	Oxygen flow reading from Q1 invalid.	1. See error 5617.
	5649	Oxygen flow reading from Q3 invalid.	1. See error 5619.
	564A	PSOL1 drive current out of range.	1. See error 561A.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 565: Compares Q1 reading with Q3 reading at steady-state flow of 120 lpm.	5651	Flow rate comparison out of range.	1. See error 5611.
	5657	Oxygen flow reading from Q1 invalid.	1. See error 5617.
	5659	Oxygen flow reading from Q3 invalid.	1. See error 5619.
	565A	PSOL1 drive current out of range.	1. See error 561A.
Test 566: Compares Q1 reading with Q3 reading at steady-state flow of 180 lpm. If flow rate of 180 lpm cannot be established, Q1/Q3 comparison is made at whatever flow rate wall supply can deliver.	5661	Flow rate comparison out of range.	1. See error 5611.
	5667	Oxygen flow reading from Q1 invalid.	1. See error 5617.
	5669	Oxygen flow reading from Q3 invalid.	1. See error 5619.
	566A	PSOL1 drive current out of range.	1. See error 561A.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 567: Flow-by offsets calibration. Compares Q1 to Q3 at flow of 0 lpm.	5671	Q1 vs. Q3 comparison out of range or oxygen controller unable to establish flow.	1. Check Q3/T3 electrical and tubing connections. 2. Replace Q3/T3. 3. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 4. Replace oxygen regulator assembly. 5. Replace interface PCB.
	5677	Oxygen flow reading from Q1 invalid.	1. Check Q1/T1 connection (J6) on interface PCB. 2. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 3. Replace interface PCB.
	5679	Oxygen flow reading from Q3 invalid.	1. Check Q3/T3 electrical and tubing connections within exhalation compartment. 2. Check Q3/T3 connection (J1) on interface PCB. 3. Replace Q3/T3. 4. Replace interface PCB.
	567A	PSOL1 drive current out of range.	1. Check for leaks in Q1/T1 couplings. 2. Adjust or replace REG1. 3. Replace proportional valve group. 4. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 5. Replace Q3/T3. 6. Replace interface PCB.
Test 568: Flow-by offsets calibration. Compares Q1 to Q3 at flow of 10 lpm. Stores oxygen and exhaled flows in battery-backed RAM.	5681	Q1 and Q3 comparison out of range or oxygen controller unable to establish flow within 15 seconds.	1. See error 5671.
	5687	Oxygen flow reading from Q1 invalid.	1. See error 5677.
	5689	Oxygen flow reading from Q3 invalid.	1. See error 5679.
	568A	PSOL1 drive current out of range.	1. See error 567A.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 569: Flow-by offsets calibration. Compares Q1 to Q3 at flow of 20 lpm. Stores oxygen and exhaled flows in battery-backed RAM.	5691	Q1 and Q3 comparison out of range or oxygen controller unable to establish flow within 15 seconds.	1. See error 5671.
	5697	Oxygen flow reading from Q1 invalid.	1. See error 5677.
	5699	Oxygen flow reading from Q3 invalid.	1. See error 5679.
	569A	PSOL1 drive current out of range.	1. See error 567A.
Test 571: Vents safety valve by de-energizing SOL5 with exhalation valve closed and patient wye blocked. Flow delivered by PSOL2 exits through vented safety valve. A flow rate of 180 lpm should not develop more than 20 cmH_2O pressure as sensed by DP. This test assumes DP and air flow sensor Q2 are functional and that tests 521 through 523 and 531 through 535 were passed.	5711	Safety valve relief pressure test failed. DP reading should be less than 20 cmH_2O.	1. Adjust or replace REG4. 2. Replace safety valve. 3. Replace SOL5. 4. Replace interface PCB.
	5716	DP reading invalid. DP reading should be less than 20 cmH_2O.	1. Check pressure transducer PCB connector J4. 2. Replace pressure transducer PCB. 3. Replace interface PCB.
	5717	Oxygen reading from Q1 invalid.	1. Check Q1/T1 connection (J6) on interface PCB. 2. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 3. Replace interface PCB.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 572: Derives system compliance as a weighted average of three points along volume/pressure curve. A flow rate of 5 lpm is established and delivered volume required to obtain 30, 60, and 85 cmH_2O pressure is used to calculate system compliance. This test assumes tests 561 through 566 were passed. If test fails, ventilator uses a default value of 0.01 mL/cmH_2O.	5721	System compliance reading invalid or unable to establish 5 lpm flow. Unable to pressurize to desired value within 15 seconds.	1. Verify that patient wye is blocked and tests 531 through 535 passed. 2. Check for patient tubing system leaks. Verify that tests 541 through 543 passed. 3. Replace patient tubing system with Puritan Bennett-approved system.
	5726	Patient system failed to achieve desired pressure.	1. Verify that patient wye is properly blocked, exhalation valve is active, and tubing system does not leak. 2. Check pressure transducer PCB connector J4. 3. Replace pressure transducer PCB. 4. Replace interface PCB.
	5727	Temperature compensated Q1 flow invalid.	1. Check that external oxygen supply is connected and pressure level is 30 psi (206.95 kPa) or greater. 2. Check Q1/T1 connection (J6) on interface PCB. 3. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 4. Replace interface PCB.
Test 572: (continued)	572A	PSOL1 drive current out of range.	1. See error 561A.
Test 573: Pressurizes safety valve and tests pressure relief. A flow rate of 2 lpm is used to stabilize system pressure at safety valve cracking pressure. Once the pressure is stable, the flow rate is steadily increased to a maximum of 180 lpm. P2 is verified for a stable reading not to exceed 150 cmH_2O. This test assumes test 572 was passed.	5731	Unable to establish 2 lpm oxygen flow; or cracking pressure outside range 90 to 150 cmH_2O; or at maximum flow, pressure is outside range 80 to 160 cmH_2O.	1. Tubing compliance too great. Use shorter tubing. 2. Check oxygen supply for given flow rate. 3. Adjust or replace REG4. 4. Replace safety valve assembly. 5. Adjust or replace REG1. 6. Check for leaks in Q1/T1 couplings. 7. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 8. Replace interface PCB. 9. Replace proportional valve group. 10. Replace internal exhalation valve.
	5735	P2 reading invalid. P2 pressure action assumes that test 521 was passed.	1. Check pressure transducer PCB connector J4. 2. Replace pressure transducer PCB. 3. Replace interface PCB.
	5737	Oxygen reading from Q1 invalid	1. Check Q1/T1 connection (J6) on interface PCB. 2. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 3. Replace interface PCB.
	573A	PSOL1 drive current out of range.	1. See error 561A.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 581: Cross-checks P1 and DP at 0 cmH$_2$O with system pressure relieved. This test assumes test 572 was passed and no leaks have been found.	5811	P1/DP comparison out of range.	1. Adjust or replace REG5, and replace jet venturi. 2. Check pressure transducer PCB connector J4. 3. Replace pressure transducer PCB. 4. Replace interface PCB. 5. Replace SOL7.
	5814	Invalid P1 reading.	1. Replace REG5. 2. Replace pressure transducer PCB.
	5816	DP reading invalid. DP pressure action assumes that test 521 was passed.	1. Check pressure transducer PCB connector J4. 2. Replace pressure transducer PCB. 3. Replace interface PCB.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 582: Prompts operator to set PEEP to 0 cmH$_2$O and verifies pressure reading.	5821	PEEP did not achieve value of 0 cmH$_2$O.	1. Operator did not rotate <PEEP/CPAP> control to fully counter-clockwise position. Continue Total EST as described in Section 5, making sure PEEP pressure reading is zero during next test pass. 2. Verify that tests 521 through 524 passed.
	5823	Operator response timed out.	1. Operator did not set PEEP pressure within 15 seconds. Continue Total EST as described in Section 5. 2. Replace REG5 and jet venturi.
	5824	P1 reading invalid. PEEP pressure action assumes that test 521 was passed.	1. Check REG5 for leaks. 2. Check pressure transducer PCB connector J4. 3. Check connection of pneumatic cable to motherboard. 4. Replace pressure transducer PCB. 5. Replace interface PCB.
Test 583: Calculates average area ratio [(P1 + DP) / P1] applied to exhalation valve over PEEP range of 0 to 36 cmH$_2$O. Writes ratio into battery-backed RAM. The operator is prompted to raise PEEP, then to lower it to various values. This test assumes tests 561 through 566 were passed. If test fails, ventilator uses default value of 1.35.	5831	Unable to establish 2 lpm oxygen flow; or area ratio outside range 0.90 through 9.0.	1. Check oxygen supply for given flow rate. 2. Check for leaks in Q1/T1 couplings. 3. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 4. Adjust or replace REG1. 5. Replace proportional valve group. 6. Replace interface PCB. 7. See error 5621. 8. Adjust or replace REG5. 9. Replace exhalation valve.
	5833	Operator response timed out.	1. Operator did not respond to prompt within 1 minute. Continue Total EST as described in Section 5. 2. Check that exhalation valve does not leak. 3. Check oxygen supply connection. 4. Adjust or replace REG5 and jet venturi. 5. Check pressure transducer PCB connector J4. 6. Replace pressure transducer PCB. 7. Replace interface PCB.
	5834	P1 reading invalid. PEEP pressure action assumes that test 521 was passed.	1. Adjust or replace REG5 and jet venturi. 2. Check pressure transducer PCB connector J4. 3. Replace pressure transducer PCB. 4. Replace interface PCB. 5. Replace exhalation valve.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 583 (continued)	5836	DP reading invalid.	1. Check pressure transducer PCB connector J4. 2. Replace pressure transducer PCB. 3. Replace conversion PCB. 4. Replace interface PCB. 5. Replace SOL6.
	5837	Oxygen flow reading from Q1 invalid.	1. Check Q1/T1 connection (J6) on interface PCB. 2. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 3. Replace interface PCB.
	583A	PSOL1 drive current out of range.	1. Check oxygen supply connection and pressure. 2. See error 561A.
Test 591: Checks whether a nebulizer is attached to ventilator by prompting operator.	5913	Operator response to "NEB ATTACHED/" prompt in display timed out.	1. Operator failed to respond to prompt within 15 seconds. Continue Total EST as described in Section 5.
Test 592: Directs nebulizer output through oxygen nebulizer solenoid SOL1 and oxygen supply line. This test assumes oxygen supply line and nebulizer are attached correctly and that flow through Q1 is within tolerance of that measured by Q3. This test assumes proper operation of Q1 and Q3, i.e., successful completion of tests 561 through 566.	5921	Nebulizer flow at Q3 or Q1 out of range.	1. Check that <PEEP/CPAP> control is set to off position. 2. Empty liquid from nebulizer vial. 3. Check proper nebulizer connection and clear flow in nebulizer venturi. Verify that approved patient tubing system is in use. 4. Check Q3/T3 electrical and tubing connections. 5. Replace SOL1. 6. See error 5611.
	5927	Oxygen flow reading from Q1 invalid.	1. Check Q1/T1 connection (J5) on interface PCB. 2. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 3. Replace interface PCB.
	5929	Exhaled flow reading from Q3 invalid.	1. Check Q3/T3 electrical and tubing connections. 2. Check Q3/T3 connection (J1) on interface PCB. 3. Replace Q3/T3. 4. Replace interface PCB.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 593: Directs nebulizer output through nebulizer air solenoid SOL2 from air supply line. This test assumes that air supply line and nebulizer are attached correctly and that Q2 and Q3 are operating properly, i.e., successful completion of tests 551 through 556.	5931	Nebulizer flow at Q3 or Q2 out of range.	1. Check that <PEEP/CPAP> control is set to off position. 2. Empty liquid from nebulizer vial. 3. Check proper nebulizer connection and clear flow in nebulizer venturi. Verify that approved patient tubing system is in use. 4. Check Q3/T3 electrical and tubing connections within exhalation compartment.
	5938	Air flow reading from Q2 invalid.	1. Check Q2/T2 connection (J6) on interface PCB. 2. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 3. Replace interface PCB.
	5939	Exhaled flow reading invalid.	1. Check proper nebulizer, oxygen supply, and tubing connections within exhalation compartment. 2. Check connections of Q3/T3 and heated bacteria filter. 3. Replace Q3/T3. 4. Replace SOL2.
Test 601: Prompts operator for compressor configuration and directs operator to remove wall air input. Checks PS2 and PS3 for actuation.	6011	Presence of compressor not detected.	1. Respond to prompt "COMPR ATT/" by pressing <ENTER> if unit has compressor, or <CLEAR> if unit does not have compressor. Continue Total EST as described in Section 5. 2. Check start of compressor operation and proper connection of compressor or proper setting of PS3. 3. Check PS2 actuation. 4. Replace PS2 or PS3. 5. Replace interface, conversion, or CPU PCB. 6. Replace compressor relay. 7. Replace compressor.
	6013	Operator response to "COMPR ATT/" or "DISCONNECT AIR" in display timed out.	1. Press <ENTER> to resume Total EST operation at next test or <ALARM RESET> to exit Total EST. Press <*> to repeat test.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 602: Response to the compressor is verified by the previous Test 601. Verifies compressor flow by allowing a 120 lpm flow through PSOL2. This test assumes tests 551 through 556 were passed.	6021	Air flow measured at Q2 failed to achieve 120 lpm.	1. Check that compressor inlet and outlet filters, F5 and F6, are clear of obstruction. 2. Test for leaks between compressor outlet and ventilator base. Check for leaks around Q2/T2 couplings. 3. Verify that no flow is coming out of air inlet port. 4. Adjust or replace REG3. 5. Check pulsation damper connection and condition. 6. Replace compressor. 7. Replace compressor shock mounts.
	6028	Q2 air flow reading invalid.	1. Check Q2/T2 connection (J6) on interface PCB. 2. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 3. Replace interface PCB.
	602B	PSOL2 drive current out of range.	1. Check compressor compartment flow rate (See Section 4). 2. Replace proportional valve group. 3. Verify that no flow is coming out of air inlet port.
Test 611: Invokes BUV and verifies that microprocessor is unable to control safety valve, PSOLs, SOL8, SOL3, and SOL4. This test assumes proper functioning of flow sensors Q1 and Q2 (tests 551 through 561 passed) as well as DP.	6111	BUV rate less than 8 bpm.	1. Adjust BUV volumes. 2. Replace interface PCB. 3. Replace PS4. 4. Replace pressure transducer PCB. 5. Replace conversion PCB.
	6116	DP reading less than or equal to 13 cmH_2O during BUV inspiration and greater than or equal to 5 cmH_2O during BUV exhalation.	1. Replace pressure transducer PCB. 2. Replace interface PCB.
	6117	Q1 oxygen flow reading less than or equal to 5 lpm.	1. Check Q1/T1 connection (J6) on interface PCB. 2. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 3. Replace interface PCB. 4. Replace conversion PCB. 5. Adjust/replace REG1. 6. Replace proportional valve group.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 611: (continued)	6119	Q3 exhaled flow reading less than or equal to 5 lpm.	1. Check Q3/T3 electrical connection within exhalation compartment. 2. Check Q3/T3 connection (J1) on interface PCB. 3. Replace Q3/T3. 4. Replace PS4. 5. Replace interface PCB. 6. Replace conversion PCB.
Test 612: Tests operation of crossover solenoid valve SOL3 after prompting operator to disconnect oxygen supply. Establishes 10 lpm air flow. Energizes SOL3, causing oxygen supply to pilot safety valve, and resulting in all flow being vented and pressure rise at patient wye being prevented (less than 2 cmH$_2$O). De-energizes SOL3, causing air supply to pilot safety valve and increasing patient pressure above 30 cmH$_2$O. This test assumes tests 541 through 543 and tests 551 through 556 were passed.	6121 6123 6126 6128 612B	SOL3 failed to meet specified pressure limits at patient wye. Air flow controller unable to establish 10 lpm flow after 30 seconds.	1. Check that oxygen supply has been disconnected and back pressure bled from line. Check electrical and pneumatic connections to SOL3. 2. Verify that no flow is coming out of top of SV/CV3. 3. Replace SOL3. 4. Replace pressure transducer PCB. 5. Replace SV/CV3. 6. Replace conversion PCB. 7. Replace interface PCB. 8. Replace motherboard. 9. Check for correct orientation of PS4. 10. Replace CPU PCB. 11. Replace PS4. 12. Clean R1 and R2.
Test 613: Invokes BUV and monitors delivered air volume using Q2. The volume of delivered air is displayed in PEAK FLOW lpm display.	6131	BUV air volume out of range 375 to 625 mL.	1. Adjust BUV volumes. 2. Check air supply for given flow rate. 3. Check for leaks in Q2/T2 couplings. 4. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 5. Adjust or replace REG2. 6. Replace proportional valve group. 7. Replace interface PCB. 8. Replace pressure transducer PCB. 9. Replace conversion PCB. 10. Replace PS4.
	6133	Operator did not respond to prompt "UNBLOCK WYE" within 30 seconds.	1. Refer to Section 5 to continue Total EST.
	6138	Q2 air flow reading invalid.	1. Check Q2/T2 connection (J6) on interface PCB. 2. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 3. Replace interface PCB. 4. Replace conversion PCB.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 614: Invokes BUV and monitors delivered oxygen volume using Q1. The volume of delivered oxygen is displayed in TIDAL VOL liters display.	6141	BUV oxygen volume out of range 375 to 625 mL.	1. Adjust BUV volumes. 2. Check oxygen supply for given flow rate. 3. Check for leaks in Q1/T1 couplings. 4. Replace Q1/T1 and oxygen flow sensor EPROM, U403 (80188) or U302 (8088). 5. Adjust or replace REG1. 6. Replace proportional valve group. 7. Replace interface PCB. 8. Replace pressure transducer PCB. 9. Replace conversion PCB. 10. Replace PS4.
	6143	Operator did not respond to prompt "CONNECT O2" within 30 seconds.	1. Refer to Section 5 to continue Total EST.
	6147	Q1 oxygen flow reading invalid.	1. Check Q1/T1 connection (J6) on interface PCB. 2. Replace Q1/T1 and oxygen flow sensor EPROM, U403 (80188) or U302 (8088). 3. Replace interface PCB. 4. Replace conversion PCB.
Test 621: Keyboard test for <ALARM RESET> key. Operator has two chances to press correct key.	6211	Invalid key read. This error condition could be caused by an operator timeout or a short in keyboard.	1. Incorrect keystroke by operator. Press <ENTER> to restart Total EST at next test or press <ALARM RESET> to abort Total EST. 2. Check connection of keyboard to front panel display PCB. 3. Replace DCI-display controller or display controller PCB. 4. Replace keyboard. 5. Replace front panel display PCB.
Test 622: Keyboard test for <MANUAL INSPIRATION> key.	6221	Invalid key read. Error condition could be caused by operator timeout.	1. See error 6211.
Test 623: Keyboard test for <MANUAL SIGH> key.	6231	Invalid key read. Error condition could be caused by operator timeout.	1. See error 6211.
Test 624: Keyboard test for <CLEAR> key.	6241	Invalid key read. Error condition could be caused by operator timeout.	1. See error 6211.
Test 625: Keyboard test for <LOW EXHALED TIDAL VOL> key.	6251	Invalid key read. Error condition could be caused by operator timeout.	1. See error 6211.

Table 6-4: EST Errors (All Units) (continued)

Test	Error Code	Error Description	Corrective Action
Test 626: Keyboard test for <O$_2$%> key.	6261	Invalid key read. Error condition could be caused by operator timeout.	1. See error 6211.
Test 627: Keyboard test for <HIGH PRESSURE LIMIT> key.	6271	Invalid key read. Error condition could be caused by operator timeout.	1. See error 6211.
Test 628: Keyboard test for <0> key.	6281	Invalid key read. Error condition could be caused by operator timeout.	1. See error 6211.
Test 629: Keyboard test for <9> key.	6291	Invalid key read. Error condition could be caused by operator timeout.	1. See error 6211.
Test 629A: Keyboard test for <APNEA> key.	62A1	Invalid key read. Error condition could be caused by operator timeout.	1. See error 6211.
Test 631: Communication channel A (host/ CliniVision port) test. A pattern of A-Z and 0-9 is sent in loopback mode to RS-232 channel.	6311	Channel A transmit/ receive error.	1. Check that DCI-display controller PCB (80188) or memory PCB (8088) is properly seated. 2. Replace DCI-display controller PCB or memory PCB.
Test 632: Communication channel B (printer port) test. If a printer is attached, it will output a test pattern.	6321	Channel B transmit/ receive error.	1. See error 6311.
Test 633: Real-time calendar/clock test.	6331	Real-time clock test failed.	1. See error 6311.
Test 634: Channel C (7202) port test.	6341	Channel C transmit/ receive error.	1. Check that DCI-display controller PCB is properly seated. 2. Replace DCI-display controller PCB.
Test 635: Channel D (expansion port) test.	6351	Channel D transmit/ receive error.	1. See error 6341.

Table 6-5: Communications Errors (All Units)

Test 70x: Executes DCI tasks.	70xx	Ventilator unable to communicate with external device such as 7250 Metabolic Monitor, 7202 Display, or other computer equipment.	1. Verify proper operation of external devices (including DIP switch settings and cabling). 2. Verify proper DIP switch settings on DCI-display controller or memory PCB. 3. Check connections of DCI interface, including seating of DCI-display controller PCB or memory PCB. 4. Replace DCI-display controller PCB or memory PCB.
Test 71x: Executes tasks to print report under DCI.	71xx	Ventilator unable to print DCI report.	1. Verify proper operation of printer (including DIP switch settings and cabling). 2. Verify proper DIP switch settings on DCI-display controller or memory PCB. 3. Check connections of DCI interface, including seating of DCI-display controller PCB or memory PCB. 4. Replace DCI-display controller PCB or memory PCB.
Test 72x: Executes DCI tasks.	72xx	Ventilator unable to communicate with external device such as 7250 Metabolic Monitor, 7202 Display, or other computer equipment.	1. See error 70xx.
Test 73x: Executes DCI tasks related to 7202 Display.	73xx	Ventilator unable to communicate with 7202 Display.	1. Verify proper operation of 7202 Display (including DIP switch settings and cabling). 2. Verify proper DIP switch settings on DCI-display controller or memory PCB. 3. Check connections of DCI interface, including seating of DCI-display controller PCB or memory PCB. 4. Replace DCI-display controller PCB or memory PCB.
Test 74x: Executes tasks related to 7202 Display.	74xx	Ventilator unable to communicate with 7202 Display.	1. See error 73xx.
Test 76x: Executes tasks related to Waveforms option.	76xx	Ventilator unable to complete Waveforms tasks.	1. See error 73xx. 2. Check connections of DCI interface, including seating of DCI-display controller PCB or memory PCB. 3. Replace DCI-display controller PCB or memory PCB.

Table 6-6: Faults (All Units)

Test 99x:			
Test 99x: Detects transducer and other hardware faults using a series of logical tests that monitor normal ventilator operations. Operating the ventilator beyond rated specifications or in configurations not expressly supported by the operator's manual may defeat these logical tests and induce artificial faults. Transducer faults detected during normal operations indicate that out-of-range or inaccurate measurements have been made.	9901	Oxygen flow sensor (Q1) reading out of range.	1. Run Total EST. 2. Check Q1/T1 connection (J5) on interface PCB. 3. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 4. Replace interface PCB.
	9902	Air flow sensor (Q2) reading out of range.	1. Run Total EST. 2. Check Q2/T2 connection (J6) on interface PCB. 3. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 4. Replace interface PCB.
	9903	Exhalation flow sensor (Q3/T3) reading out of range.	1. Run Total EST. 2. Check Q3/T3 electrical and tubing connections within exhalation compartment. 3. Check Q3/T3 connection (J1) on interface PCB. 4. Replace Q3/T3. 5. Replace interface PCB. 6. Replace Q3/T3 harness.
	9904	A/D conversion timeout. A/D converter on conversion PCB failed to respond within allotted time period.	1. Replace conversion PCB. 2. Replace CPU PCB. 3. Check cable between CPU PCB and conversion PCB.
	9905	Compensated atmospheric pressure reading out of range.	1. Run Total EST. 2. Remove and replace exhalation bacteria filter. 3. Check pneumatic harness connections. 4. Replace pressure transducer PCB. 5. Replace interface PCB. 6. Replace SOL6.
	9906	PS2 and PS3 remain closed.	1. Verify compressor turns on when wall air is not applied. Verify PS3 connection. 2. Check connections between compressor compartment and utility panel, pins 3 and 4. 3. Replace interface PCB. 4. Replace PS3. 5. Replace PS2. 6. Replace motherboard. 7. Replace conversion PCB.
	9907	Watchdog timeout did not occur under program control.	1. Run Total EST. 2. Replace CPU PCB. 3. Replace DCI-display controller or display controller PCB. 4. Replace CPU PCB.

Table 6-6: Faults (All Units) (continued)

Test 99x (continued)	9908	BUV is active without a detected POST or system fault.	1. If fault is intermittent (cannot be duplicated), do the following:
			  a. Make these ventilator control settings:
			    \<PEEP/CPAP\> knob - Maximum
			    \<NEBULIZER\> - On
			    Mode - \<CPAP\>
			    \<SENSITIVITY\> - 2 cmH$_2$O
			    \<O$_2$%\> - 60%
			    Apnea interval - 60 seconds
			  b. Disconnect main flow bacteria filter/patient circuit from ventilator outlet.
			  c. Monitor +12 V at J14 (Section 7.6.7).
			  d. Press \<MANUAL INSPIRATION\>.
			  e. If 9908 error is present and voltage is low, replace +12 V supply.
			  f. If 9908 error is present and unit has a 7202 Display, retest without Display. If 9908 is no longer present, replace EL PCB in Display.
			2. Replace interface PCB.
			3. Replace conversion PCB.
			4. Replace both interconnect cables (P/N 4-019231-00) between conversion and interface PCBs.
			5. Replace DCI-display controller or display controller PCB.
			6. Replace CPU PCB.

	9909	Watchdog timeout did not occur under program control.	1. See error 9907.
	990B	PSOL1 remained in open position. Flow past Q1 was detected after PSOL1 was closed.	1. Run Total EST. 2. Check oxygen tank or supply. 3. Check for leaks in Q1/T1 couplings. 4. Replace Q1/T1 and oxygen flow sensor EPROM, U406 (80188) or U302 (8088). 5. Check electrical connection of proportional solenoid valves. 6. Replace proportional valve group. 7. Replace conversion PCB. 8. Replace interface PCB. 9. Replace REG1.
	990C	PSOL1 failed to open.	1. See error 990B.

Table 6-6: Faults (All Units) (continued)

	990D	PSOL2 remained in open position. Flow past Q2 was detected after PSOL2 was closed.	1. Run Total EST. 2. Check for leaks in Q2/T2 couplings. 3. Replace Q2/T2 and air flow sensor EPROM, U504 (80188) or U403 (8088). 4. Check electrical connection of proportional solenoid valves. 5. Replace proportional valve group. 6. Replace interface PCB. 7. Replace conversion PCB. 8. Replace pressure transducer PCB. 9. Replace REG2 if wall air is attached. 10. Check compressor compartment components for proper functioning.
	990E	PSOL2 failed to open.	1. See error 990D.
	9910	P1, P2, and DP have been in fault state for longer than 100 ms.	1. Replace pressure transducer PCB.
	9911	Watchdog timeout did not occur during a brownout condition.	1. See error 9907.
	992x	Hardware/option PAL mismatch.	1. Call Technical Support.